

REMARKS/ARGUMENTS

Reconsideration and withdrawal of the rejections set forth in the Office Action dated 3 July 2002 are respectfully requested. A separate petition for a one-month extension of time accompanies this amendment.

I. Amendments

The proposed amendment to Figure 8 schematically illustrates the outer covering discussed in the sentence bridging pages 13 and 14 (paragraph 0052), designating the outer covering with reference number 98. Paragraph 0052 of the specification has been amended to add reference number 98. Neither of these amendments introduce new matter, but instead merely illustrate in the drawings an aspect of an embodiment which was already disclosed in the specification. Upon approval of this amendment, the undersigned will submit a formal drawing reflecting this amendment to Figure 8.

The present amendment amends claims 1-3, 6, 12-17, and 32. Claims 24-31 and 36-38 have been deleted and new claims 39-42 have been added. Claims 36-38 have been canceled because they were withdrawn from consideration by the Examiner; the undersigned specifically reserves the right to pursue the subject matter of claims 36-38 at a later date. Upon entry of the present amendment, claims 1-23, 32-35, and 39-42 will remain in the application.

II. Rejections Based On Huang (35 U.S.C. §§ 102(e) and 103(a))

A Declaration of Prior Invention Under 37 C.F.R. § 1.131, signed by the inventors of this application, accompanies this response. This Declaration establishes a date of invention in Singapore prior to 18 July 2001, the effective date of Patent Application Publication No. US 2002/0024273 ("Huang") under §102(e)(1). Since Singapore has been a WTO member country since January of 1995, Huang is not available as prior art against the present application. (35 U.S.C. § 104) The present rejections of claims 1-9 and 11-35 as unpatentable over Huang, therefore, are moot.

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III. Rejections Based On Asada, Mostafazadeh, and/or Park (35 U.S.C. § 103(a))

In the present Office Action, the Examiner also rejected claims 1-9 and 11-35, i.e., all of the considered claims, as obvious over Asada, et al. US Patent 5,665,651 ("Asada") in view of Mostafazadeh, et al. US Patent 6,117,710 ("Mostafazadeh") or in view of Park, et al. US Patent 6,137,162 ("Park"). The undersigned respectfully submits that claims 1-9, 11-23, and 32-35, as amended, are allowable over any reasonable combination of these references. The undersigned would also like to note that claim 10, though withdrawn, has not been canceled in the present application. Claim 10 depends from claim 1 and should be allowed in the present application upon allowance of claim 1 despite the prior restriction requirement.

A. Claims 1-11

Claim 1, as amended, recites a method of assembling a "stacked" microelectronic device assembly. This method includes, *inter alia*, electrically coupling the first microelectronic device assembly to a substrate and electrically coupling a back surface of the lead fingers of a second microelectronic device assembly to a front surface of the lead fingers of the first microelectronic device assembly. This defines a gap between the exposed back surface of the microelectronic device of the second assembly and a front surface of the first assembly. The method further calls for applying an electrically insulative covering over a front surface of the lead fingers of the second assembly. As noted in the paragraph bridging pages 13-14 of the present specification, such a covering may reduce the likelihood of inadvertent electrical short circuits.

In Figure 15, Asada illustrates several semiconductor devices stacked on a circuit board. Figure 15 is discussed only briefly in Asada's specification (see column 9, lines 13-28). Park also illustrates a system with two stacked packages (Figure 6). The undersigned sees no suggestion in either of these references to apply an electrically insulative covering over a front surface of the lead fingers of a second microelectronic device assembly, as called for in claim 1.

Mostafazadeh is concerned with producing a conventional leaded package or BGA package and does not address stacked microelectronic device assemblies.

Hence, there is no mention in Asada, Mostafazadeh, or Park of applying an electrically insulative covering in the manner specified in claim 1. The undersigned, therefore, respectfully submits that no combination of Asada, Mostafazadeh, and Park can support even a *prima facie* § 103 rejection. Claims 2-11 depend from claim 1 and are believed to be patentable at least by virtue of their dependence from an allowable base claim.

B. Claims 12-23

Claim 12, as amended, calls for, among other steps, removing excess encapsulant deposited on the smaller front surface of any of the L-shaped lead fingers and removing the support, leaving each lead finger with an exposed back surface that is larger than its front surface. The undersigned sees nothing in Asada, Mostafazadeh, or Park that suggests removing excess encapsulant in this fashion. Consequently, claim 12 is believed to define patentably over these three references. Claims 13-23 are all believed to be patentable at least by virtue of their dependence from claim 12.

C. Claims 32-35

Claim 32, as amended, calls for a stacked microelectronic device assembly that includes a first subassembly including plurality of first lead fingers, each of which has an exposed front contact and an exposed back contact; a second subassembly including a plurality of second lead fingers, each of which has a front contact and an exposed back contact; a plurality of electrical connectors coupling exposed front contacts of the first lead fingers to exposed back contacts of the second lead fingers; and an electrically insulative covering over the front contacts of the second lead fingers. As explained above in connection with claim 1, the undersigned sees nothing in Asada, Mostafazadeh, or Park that would lead one of ordinary skill in the art to apply an electrically insulative

covering over the front surface of the lead fingers of the second microelectronic device assembly. By analogy to that prior discussion, the undersigned respectfully submits that claim 32, as amended, is patentable over any combination of these references. Since claims 33-35 depend from claim 32, they are believed to be allowable over the applied references at least on that basis.

IV. Conclusion

In view of the foregoing, the claims pending in the application comply with the requirements of 35 U.S.C. § 112 and are patentable over the applied art. A Notice of Allowance is, therefore, respectfully requested. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to call the undersigned at (206) 264-3848.

Respectfully submitted,

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Appl. No. 09/944,246

APPENDIX**VERSION WITH MARKINGS TO SHOW CHANGES MADE****In the Specification:**

The electrical connector 96 has a thickness which spaces the first and second subassemblies 10a-b from one another, defining an intercomponent gap 94 therebetween. If so desired, this intercomponent gap 94 can be filled with an underfill material or the like. This is not believed to be necessary, though, and leaving the intercomponent gap 94 exposed to the ambient environment may further facilitate cooling of the die 60b via its exposed back surface 66. An outer covering ~~(not shown)~~98 of an electrically insulative material may be applied over the front contacts 36b of the upper subassembly 10b to avoid any inadvertent electrical short circuits. Alternatively, a third microelectronic device (which may be another microelectronic device assembly 10 such as that shown in Figures 7A-C) may be stacked on top of the second subassembly 10b and electrically connected thereto via the front contacts 34b.

In the Claims:

1. (Amended) A method of assembling a stacked microelectronic device assembly, comprising:
assembling a plurality of microelectronic device assemblies, each
microelectronic device assembly being assembled by:
releasably attaching a support to a lead frame, the lead frame having a front surface, a back surface, a thickness, and having an opening passing through the thickness, and a plurality of lead fingers, the support having an exposed surface spanning the opening;
releasably attaching a back surface of a microelectronic device to the exposed surface of the support;
electrically coupling the microelectronic device to the lead frame;

delivering an encapsulant to a cavity defined by the support, the microelectronic device, and a peripheral dam carried by the lead frame, the encapsulant bonding the microelectronic device to the lead frame; and removing the support, leaving the back surface of the microelectronic device exposed; and

cutting the lead frame to separate a plurality of electrically isolated lead fingers from the peripheral dam;

electrically coupling a first one of the microelectronic device assemblies to a substrate;

electrically coupling the lead fingers of a second one of the microelectronic device assemblies to the lead fingers of the first microelectronic device assembly with a back surface of the lead fingers of the second microelectronic device assembly being coupled to a front surface of the lead fingers of the first microelectronic device assembly, defining a gap between the exposed back surface of the microelectronic device of the second microelectronic device assembly and a front surface of the first microelectronic device assembly; and

applying an electrically insulative covering over a front surface of the lead fingers of the second microelectronic device assembly.

2. (Amended) The method of claim 1 wherein cutting the lead frame comprises ~~further comprising cutting the lead frame within a periphery defined by the peripheral dam to separate a plurality of electrically isolated lead fingers.~~
3. (Amended) The method of claim 1 wherein assembling each microelectronic device assembly further comprising comprises ~~comprising~~ positioning an upper mold element against an upper surface of the lead frame prior to delivering the encapsulant.
6. (Amended) The method of claim 1 wherein electrically coupling the microelectronic device to the lead frame comprises coupling an ~~the active~~

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surface of the microelectronic device die ~~is coupled to~~ the lead frame by a plurality of bond wires.

12. (Amended) A method of assembling a microelectronic device assembly including a microelectronic die and a plurality of electrically independent lead fingers, comprising:

releasably attaching a first-support to a back surface of a first-lead frame and to a back surface of a first-microelectronic die, the first-lead frame including a front surface spaced from the back surface and an opening extending from the front surface to the back surface, the opening having an inner periphery defined by an first-outer member and a plurality of L-shaped first lead fingers extending inwardly from the first-outer member, the first-die being positioned in the opening with a periphery of the first-die spaced inwardly of at least part of the inner periphery of the opening to define a first peripheral gap;

electrically coupling the first-die to the first-lead fingers with a plurality of first bonding wires;

filling the opening above the first-support with an first-encapsulant, the first encapsulant entering the first-peripheral gap and attaching the first-lead frame to the first-die;

removing excess encapsulant deposited on front surfaces of any of the lead fingers; and

removing the first-support, leaving the back surface of the first-die exposed and leaving a the back surface of each of the L-shaped first-lead fingers frame exposed, each lead finger thus having an exposed back surface that is larger than the front surface.

13. (Amended) The method of claim 12 further comprising separating the first-lead fingers from the first-outer member.

14. (Amended) The method of claim 12 further comprising cutting the outer member from the first-lead frame, yielding a plurality of independent first-lead fingers

connected to one another only by the first-encapsulant and by the first-bonding wires via the first-die.

15. (Amended) The method of claim 12 wherein the first-support comprises an adhesive tape, the first-lead frame and the first-die being releasably adhered to the adhesive tape and the adhesive tape forming a seal against the back surface of the first-lead frame and the back surface of the first-die to retain the first encapsulant.
16. (Amended) The method of claim 12 further comprising cutting the first-lead frame to separate the first-lead fingers from the first-outer member.
17. (Amended) The method of claim 12 wherein the support is a first support, the lead frame is a first lead frame, the microelectronic die is a first microelectronic die, the outer member is a first outer member, the lead fingers are first lead fingers, the bonding wires are first bonding wires, and the encapsulant is a first encapsulant, the method further comprising:
 releasably attaching a second support to a back surface of a second lead frame and to a back surface of a second microelectronic die, the second lead frame including a front surface spaced from the back surface and an opening extending from the front surface to the back surface, the opening having an inner periphery defined by a second outer member and a plurality of second lead fingers extending inwardly from the second outer member, the second die being positioned in the opening with a periphery of the second die spaced inwardly of at least part of an inner periphery of the opening to define a second peripheral gap;
 electrically coupling the second die to the second lead fingers with a plurality of second bonding wires;
 filling the opening above the second support with a second encapsulant, the second encapsulant entering the second peripheral gap and attaching the second lead frame to the second die;

removing the second support, leaving the back surface of the second die exposed and leaving the back surface of the second lead frame exposed; and electrically coupling one of the first lead fingers to one of the second lead fingers.

32. (Amended) A stacked microelectronic device assembly, comprising:

a first subassembly having a first thickness and comprising a plurality of electrically independent first lead fingers, a first die, and a first encapsulant bonding the first die to the first lead fingers, each of the first lead fingers having a thickness equal to the first thickness and defining an exposed front contact and an exposed back contact, the first die having an exposed back surface and being electrically coupled to the plurality of first lead fingers by a plurality of first bonding wires;

a second subassembly having a second thickness and comprising a plurality of electrically independent second lead fingers, a second die, and a second encapsulant bonding the second die to the second lead fingers, each of the second lead fingers having a thickness equal to the second thickness and defining ~~an exposed~~ a front contact and an exposed back contact, the second die having an exposed back surface and being electrically coupled to the plurality of second lead fingers by a plurality of second bonding wires;

a plurality of electrical connectors, each of which electrically couples the exposed front contact of one of the first lead fingers to the exposed back contact of one of the second lead fingers; and

an electrically insulative covering over the exposed front contacts of the second lead fingers.



Approved, TH
12/03/02

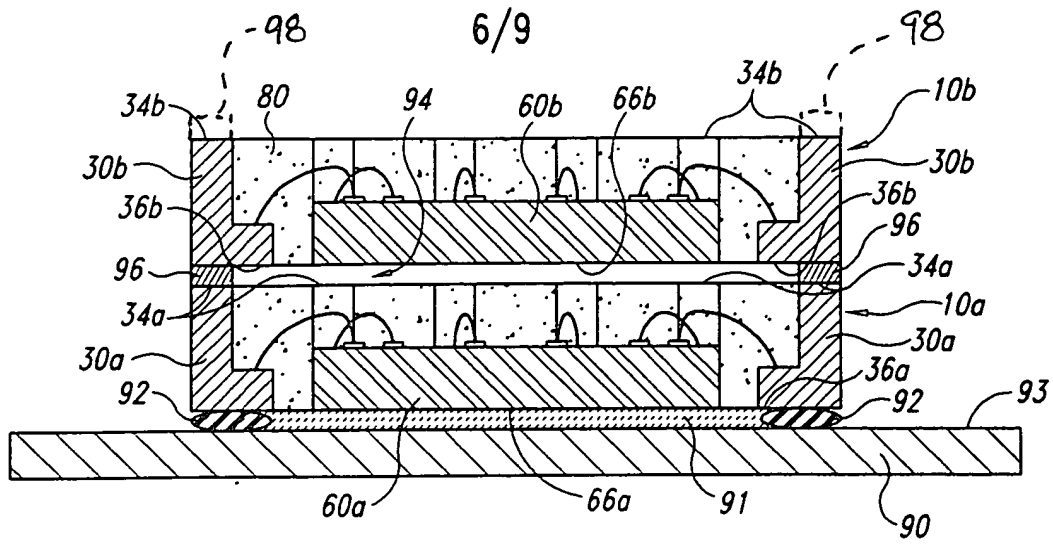


Fig. 8

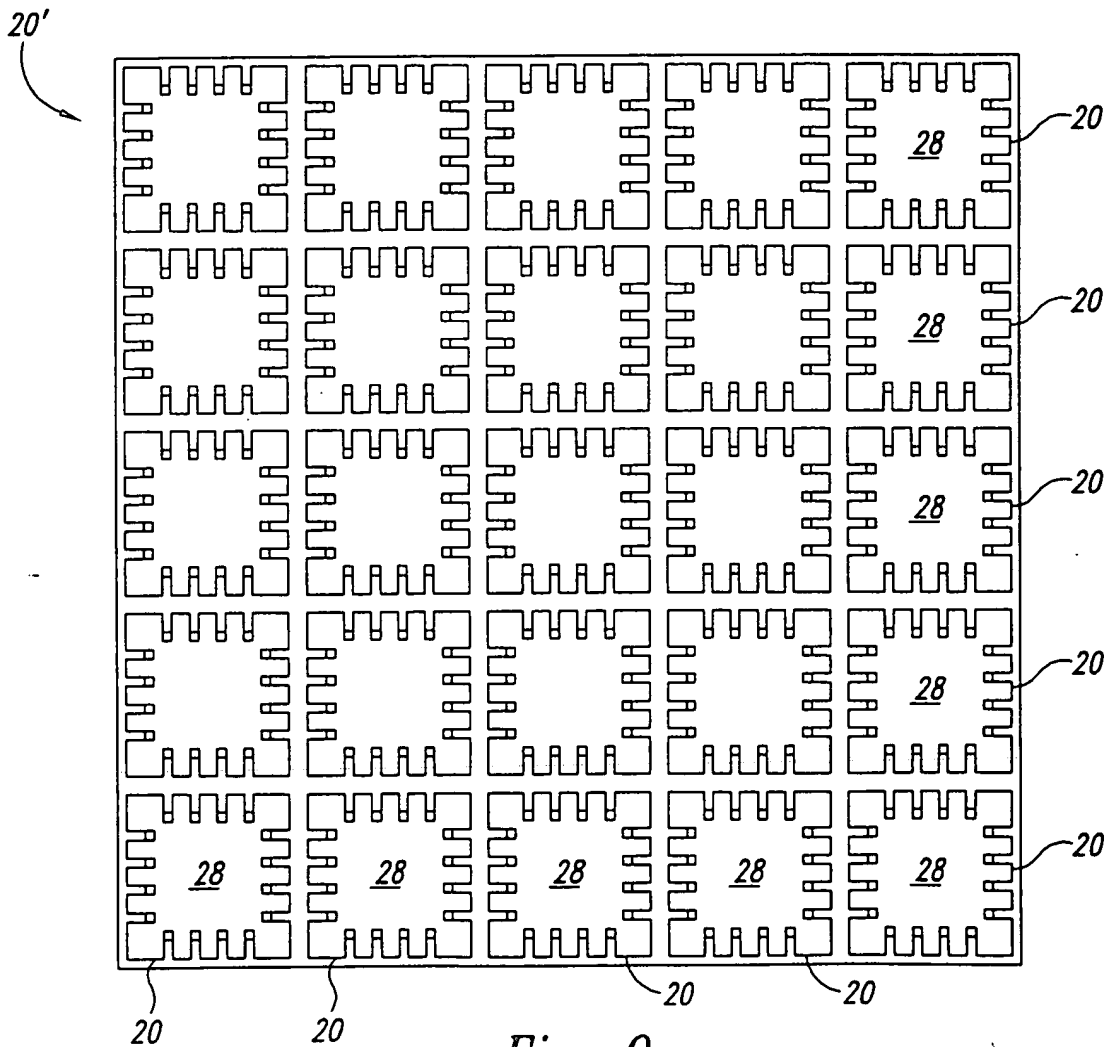


Fig. 9

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